



PATENT APPLICATION

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

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In re Application of

Gene LEE et al.

Appln. No.: 10/039,333

Group Art Unit: 1765

Filed: November 9, 2001

Examiner: B. Tran

Title: Method for Etching Tungsten  
Using  $\text{NF}_3$  and  $\text{Cl}_2$

**DECLARATION OF GENE LEE  
UNDER 37 C.F.R. § 1.131**

Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

I, Gene Lee, declare as follows:

I am a joint inventor and applicant of the invention entitled "METHOD FOR ETCHING TUNGSTEN USING  $\text{NF}_3$  AND  $\text{Cl}_2$ ", disclosed and claimed in U.S. patent application no. 10/039,333, filed November 9, 2001.

Prior to June 15, 2001, I and my co-inventor, Nam-Hun Kim had completed the etching of tungsten using  $\text{NF}_3$  and  $\text{Cl}_2$  chemistry invention as described and claimed in the subject application in this country or in a World Trade Organization (WTO) member country, as evidence by the following:

Prior to June 15, 2001, I caused tungsten deposited on a semiconductor substrate and masked by a hardmask to be etched using  $\text{NF}_3$  and  $\text{Cl}_2$  chemistry so as to physically implement the

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invention that Mr. Kim and I had conceived together.

Specifically, I used a "DPS poly-etch" processing chamber to etch tungsten on a semiconductor substrate and masked by a  $\text{Si}_3\text{N}_4$  hardmask using a mixture of  $\text{NF}_3$  gas and  $\text{Cl}_2$  gas in the course of our work for my employer, Applied Materials, Inc.

These facts are corroborated by the evidence of an Invention Alert<sup>1</sup> (attached), which Mr. Kim and I executed and provided to our employer, Applied Materials, Inc., prior to June 15, 2001. The process practiced included etch of hardmasked tungsten on a semiconductor substrate using gas mix including  $\text{NF}_3$  and  $\text{Cl}_2$ . See Invention Alert at page 4, numbered items 7. The process was implemented via a "DPS poly-etch" processing chamber. See Invention Alert at page 4, numbered item 4.

The physical implementation activity, which was conducted prior to June 15, 2001, occurred in the United States of America or in the Republic of Korea, a member of the WTO.

In view of the above discussion and the attached copy of the Invention Alert, I respectfully submit that Mr. Kim and I had completed the etching of hardmasked tungsten using  $\text{NF}_3$  and  $\text{Cl}_2$  chemistry invention as described and claimed in the subject

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<sup>1</sup> The attached Invention Alert has been redacted in accordance with the practice approved by the Manual of Patent Examining Procedure (8th ed., rev. 1 2003) at § 715.07.

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application in the United States of America or the Republic of Korea, a member of the WTO, prior to June 15, 2001.

I declare further that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issuing thereon.

Date: NOV 7, 2003

By: 

Gene Lee